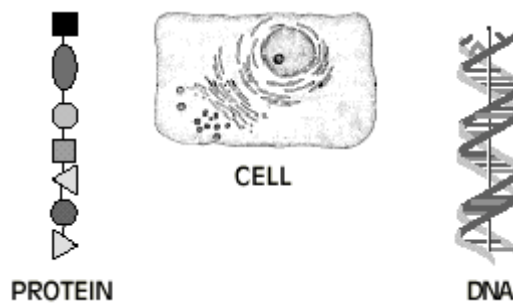


GENETICS AND EVOLUTION

As a result of studying patterns of heredity and historical changes in life forms:

Students understand how each organism carries a set of instructions (genes composed of DNA) for specifying the components and functions of the organism.

- *Describe how genetic materials are organized in genes and chromosomes in the cells of living organisms. (LIIA1)*



What is the relationship between the three structures in the diagram above?

- a. DNA is produced by protein which is produced in the cell.
- b. Protein is composed of DNA which is produced in the cell.
- c. DNA controls the production of protein in the cell.
- d. A cell is composed only of DNA and protein.

A chromosome is best described as a

- a. gene that has more than one form.
- b. green cell found in many plants.
- c. strand of DNA containing genetic information.
- d. reproductive cell found in certain kinds of bacteria.

- *Explain how the genetic information from both parents is mixed in the fertilized egg to produce an individual with new combinations of genes and traits. (LIIA2)*

In fruit flies, gray body color (G) is dominant over black body color (g). What kind of offspring would you expect from parents who are both heterozygous for body color (Gg x Gg)?

	G	g
G		
g		

- a. 0% gray, 100% black
- b. 25% gray, 75% black
- c. 75% gray, 25% black
- d. 100% gray, 0% black

Which statement about DNA is correct?

- a. A child's DNA will be unrelated to the mother's or father's DNA.
- b. A child's DNA will show similarities to both the mother's and father's DNA.
- c. A female child's DNA will exactly match the mother's DNA.
- d. A male child's DNA will exactly match the father's DNA.

Hair color in humans is an inherited trait. How is it possible for two people who had brown hair from birth to produce a child with blond hair?

Before having children, couples may seek genetic counseling to find out if their babies will be at risk of inheriting genetically transmitted diseases.

Cystic fibrosis is a common hereditary disease that usually appears in early childhood. It involves glandular disorders and leads to problems with digestion and respiration. The recessive gene for cystic fibrosis may be represented by "n," with "N" representing the dominant allele for the normal trait. Only a person with two recessive genes (nn) will have cystic fibrosis. A person with a dominant gene (N) and a recessive gene (n) does not have the disease but has the potential to transmit it to his or her children. A person with the genotype Nn is frequently called "a carrier."

After having three healthy children, Martin and Jessica went to see a genetic counselor. The counselor tested the couple and found that both Martin and Jessica are heterozygous

(Nn) for cystic fibrosis. This means that they do not have cystic fibrosis, but they could have a child with the disease.

		Jessica	
		N	n
Martin	N	NN	Nn
	n	Nn	nn

Using the chart above, the counselor explained that the couple has a 25% chance (1 in 4) of having a child with cystic fibrosis.

Martin and Jessica were disappointed. They wanted to have another child, but since they already had three healthy children, they believed that a fourth child would almost surely have cystic fibrosis.

Do you agree with Martin and Jessica's conclusion? Explain why you do or do not agree with their conclusion.

- ***Explain how genes are related to inherited traits and how genes can be manipulated by modern technologies. (LIIA3)***

What technological application from the 1990s was advanced by the discovery of the structure of DNA in the 1950s?

- a. solar cells
- b. computer viruses
- c. the Internet
- d. crime solving

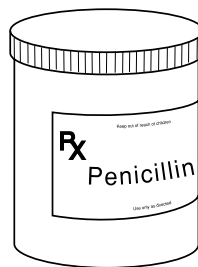
While investigating applications of science knowledge, Willy learned that scientists have used genetic engineering techniques to attach insulin-producing genes to bacterial DNA. These bacteria produce large amounts of scarce human hormones. Scientists predict that hormones produced by bacteria will be inexpensive and will not cause allergic reactions.

Scientists developed hormone-producing bacteria because they wanted to

- a. learn about bacteria.
- b. discover a cure for diseases.
- c. find a way to increase the supply of hormones for use by humans.
- d. compare the hormones produced by bacteria with hormones produced naturally.

Students understand that the basic idea of biological evolution is that the Earth's present-day species developed from earlier species.

- ***Explain how environmental changes can lead to the extinction and evolution of species. (LIIB1)***



Doctors need to be careful not to give their patients an antibiotic such as penicillin too often. If the same antibiotic is prescribed too many times, it can become less effective against bacteria. Explain fully why this is so.

In the early days of antibiotic use, penicillin and sulfonamide were used to successfully treat a variety of bacterial infections. In later years, stronger antibiotics were needed because some bacteria were either resistant to or not affected by these same antibiotics. This situation is best explained

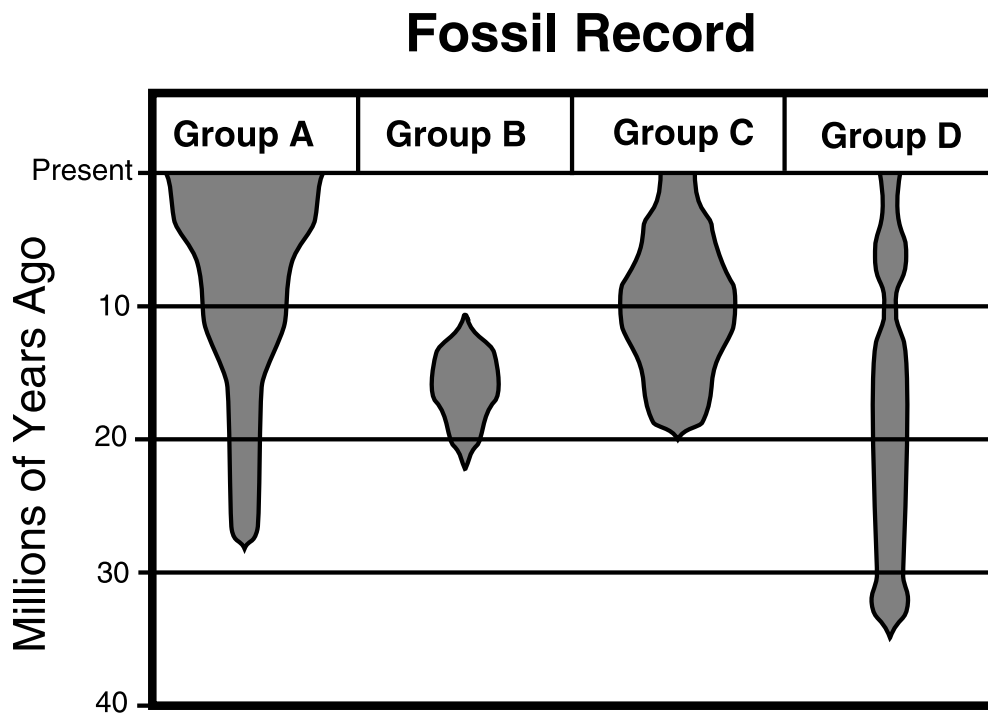
- a. by the lack of quality control in drug companies.
- b. as the result of poor nutrition.
- c. by doctors prescribing the wrong antibiotic.
- d. by the process of natural selection.

When a population of mice is infected with parasites, many of the mice die from the parasitic infection, but some mice appear as healthy as they were before being infected. Some people are considering using these parasites to control the mouse population in people's homes.

Give one advantage and one disadvantage of using these parasites instead of mouse traps or poisons to limit the population of mice.

- ***Describe how fossils and anatomical evidence provide support for the theory of evolution. (LIIB2)***

In a section of the Grand Canyon, scientists have found the fossil remains of several different groups of organisms. The diagram below represents the number and age of the fossils the scientists found. The width of each shaded area in the diagram below indicates the relative number of fossils found.



Which of the following statements is supported by the fossil record?

- Group C is now extinct.
- Group D has been in existence the longest.
- Group A is the most recent organism to come into existence.
- Group B was the most numerous organism 10 million years ago.

Which of the following is usually **most** helpful in determining the age of these fossils?

- a. the size of the fossils
- b. the color of the fossils
- c. the amount of surface area of the rock layer in which the fossils are found
- d. the depth of the rock layer in which the fossils are found

The scientists hypothesize that the four groups of fossilized organisms originated from a common ancestor. Which of the following would provide the **best** evidence that their hypothesis is correct?

- a. the number of fossils found in each group is similar.
- b. present-day members of the groups live in the same environment.
- c. fossils from each group were found in the same rock layer.
- d. members of the groups have similar physical structures.

If an intestinal cell in a butterfly contains 24 chromosomes, a butterfly egg cell would contain

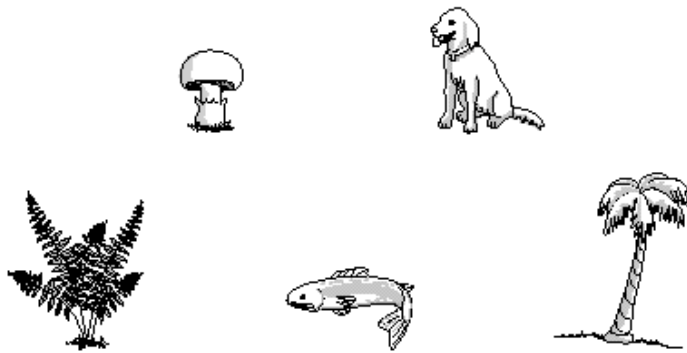
- a. 3 chromosomes.
- b. 6 chromosomes.
- c. 12 chromosomes.
- d. 24 chromosomes.

CELLS

As a result of observing and studying cells in single- and multiple-celled organisms:

Students understand the basic structures and functions of living cells.

- ***Describe the basic similarities and differences found in the structures of plant, animal and bacterial cells. (LIIIA1)***



Study the five organisms shown above. Which of the organisms have cells similar to the cell shown below?



- a. the mushroom and the dog
- b. the fern and the palm tree
- c. the dog and the fish
- d. the fern and the fish

A certain organism has many cells, each containing a nucleus. If the organism makes its own food, it would be classified as

- a. a bacterium
- b. a fungus
- c. a plant
- d. an animal

Which statement about plant and animal cells is true?

- a. Plant cells have a nucleus and a cell wall; animal cells do not have either of these structures.
- b. Plant cells have a cell wall and chloroplasts; animal cells do not have either of these structures.
- c. Plant cells have a cell wall and a cell membrane; animal cells have a cell wall but not a cell membrane.
- d. Plant cells have chloroplasts and mitochondria; animal cells have chloroplasts but do not have mitochondria.

- ***Describe the structure and explain the main functions of skin, nerve, muscle and blood cells. (LIIIA2)***

Mitochondria are used to produce energy for cells. Which type of cell would contain the most mitochondria?

- a. fat cells
- b. bone cells
- c. red blood cells
- d. muscle cells

- ***Explain how the cell membrane helps the cell to maintain its unique internal composition. (LIIIA3)***

Under what conditions will a substance be likely to enter a cell through diffusion?

- a. when the substance is a particle of food
- b. when a molecule of the substance is very large
- c. when the concentration of the substance is greater outside the cell than inside
- d. when the concentration of the substance is greater inside the cell than outside

The next two questions are based on the following situation and data table.

A laboratory technician places red blood cells into three different solutions. Observations are recorded each minute for five minutes.

Solution	Time				
	1 min.	2 min.	3 min.	4 min.	5 min.
Solution 1	No change	Cells are slightly larger.	Cells are much larger.	Cells are huge.	Cells are gone.
Solution 2	No change	No change	No change	No change	No change
Solution 3	No change	Cells are slightly smaller.	Cells are much smaller.	Cells look wilted.	Nothing that looks like a cell can be found.

Which of the following best explains what is causing the red blood cells in solution 1 to change size over the five-minute period?

- a. Solvent is entering the cells faster than it is leaving the cells.
- b. Solute is entering the cells faster than it is leaving the cells.
- c. The cells are making new protein.
- d. The cell's membranes are dissolving.

The laboratory technician concludes that red blood cells cannot function in any fluid except serum. Which of the following best characterizes this conclusion?

- a. It is accurate on the basis of the information given.
- b. It is accurate because the cells changed in all the solutions but one.
- c. It is inaccurate because the cells were outside the body.
- d. It cannot be substantiated with the data provided.

Students understand that cells divide for growth of the organism, repair and reproduction.

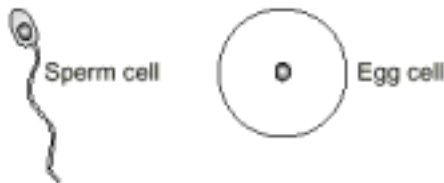
- ***Describe the process of cell division (mitosis) and explain how this process is important in growth of the organism and repair of tissues. (LIIB1)***

Mitosis, the process by which the nucleus of a cell divides into two nuclei, each containing a complete set of the cell's chromosomes, is essential to life because it

- a. contains four stages for gametes.
- b. maintains genetic continuity from one generation to the next.
- c. controls cell functions to ensure successful development.
- d. provides energy for the cells.

- ***Describe the process producing reproductive cells (meiosis) in females (egg cells) and males (sperm cells). (LIIB2)***

The diagram below represents two human cells.

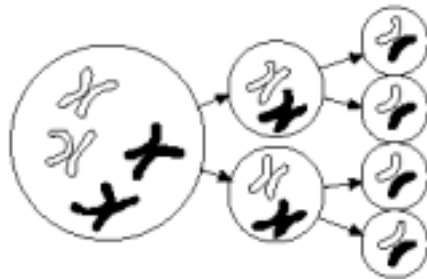


These cells are a direct result of

- a. mitotic cell division.
- b. fertilization.
- c. sex linkage.
- d. gametogenesis.

The distribution of chromosomes in one type of cell division is shown in the diagram below.

Which process is represented in the diagram?



- a. asexual reproduction
- b. mitosis
- c. meiosis
- d. vegetative propagation

Body cells of fruit flies contain only 8 chromosomes, compared to human cells that contain 46. Scientists used studies of fruit flies to discover how egg and sperm cells (gametes) are formed. What did they observe?

- a. Body cells of the offspring flies had 16 chromosomes.
- b. Sperm cells from the male had 8 chromosomes.
- c. Egg cells from the female had 4 chromosomes.
- d. Body cells of the offspring flies had 4 chromosomes.

HUMAN BIOLOGY

As a result of studying the structure and function of the human body:

Students understand the structure of the human body and how environmental conditions, nutrition, physical activity and pathogens affect its functioning.

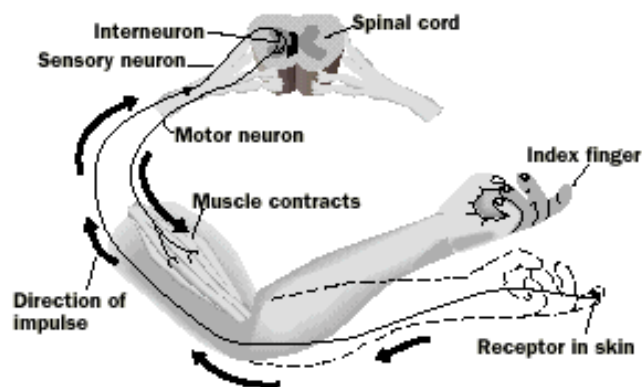
- ***Describe the structure and function of the major human organ systems (i.e., the circulatory, respiratory, digestive, reproductive and nervous systems). (LIVA1)***

Which of the following **best** describes absorption?

- a. movement of nutrient molecules into cells lining the digestive tract
- b. passage of undigested material out of the digestive tract
- c. chemical breakdown of food
- d. the act of eating

Describe how the nutrients from digested bread move from the digestive organs to muscles and other tissues where they are needed.

Use the following diagram to answer the question.



When an index finger is hit by a hammer, an advantage of the reflex arc is that nerve impulses

- a. do not need to travel to the brain first.
- b. travel quickly to the brain.
- c. travel faster across nerve end gaps.
- d. activate sensory organs.

Blood type indicates the type of antigens present on red blood cells. For a transfusion to be successful, the donor's blood type and the recipient's blood type must be compatible. If not, antibodies present in the plasma of the recipient will cause the blood to clump.

BLOOD TYPES

BLOOD TYPE	ANTIGENS	ANTIBODIES
O	none	anti-A and anti B
A	A	anti-B
B	B	anti-A
AB	A and B	none

According to the table above, a person with which blood type could donate blood to any other individual, regardless of the recipient's blood type?

- a. O
- b. A
- c. B
- d. AB

- ***Explain the role of nutrients and physical activity in the functioning of the human body. (LIVA2)***

Nutrition involves those activities by which organisms

- a. remove cellular waste products.
- b. obtain and process materials needed for other activities.
- c. exchange gases with their environment.
- d. absorb and circulate materials.

Which of the following statements **best** explains why all animals need food in order to live?

- a. Body mass must be maintained, and food supplies the needed body mass.
- b. Cells, tissues, and organs require energy to carry out their tasks, and food provides the needed energy.
- c. A balanced diet is necessary to maintain strong bones and healthy teeth.
- d. Food contains essential vitamins and minerals bodies need in order to synthesize other nutrients.

- ***Explain the human body's defense system against infectious diseases and the role of antibiotics and vaccinations. (LIVA3)***

(no examples provided)